Just-in-Time Evidence-Based E-mail "Reminders" in Home Health Care: Impact on Nurse Practices

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Objective. To test the effectiveness of two interventions designed to improve the adoption of evidence-based practices by home health nurses caring for heart failure (HF) patients.

Data Sources/Study Setting. Information on nurse practices was abstracted from the clinical records of patients admitted between June 2000 and November 2001 to the care of 354 study nurses at a large, urban, nonprofit home care agency.

Study Design. The study employed a randomized design with nurses assigned to usual care or one of two intervention groups upon identification of an eligible patient. The *basic* intervention was a one-time e-mail reminder highlighting six HF-specific clinical recommendations. The *augmented* intervention consisted of the initial e-mail reminder supplemented by provider prompts, patient education material, and clinical nurse specialist outreach.

Data Collection. At each home health visit provided by a study nurse to an eligible HF patient during the 45-day follow-up period, a structured chart abstraction tool was used to collect information on whether the nurse provided the care practices highlighted in the e-mail reminder.

Principal Findings. Both the basic and the augmented interventions greatly increased the practice of evidence-based care, according to patient records, in the areas of patient assessment and instructions about HF disease management. While not all results were statistically significant at conventional levels, intervention effects were positive in virtually all cases and effect magnitudes frequently were large.

Conclusions. The results of this randomized trial strongly support the efficacy of just-in-time evidence-based reminders as a means of changing clinical practice among home health nurses who are geographically dispersed and spend much of their time in the field.

Key Words. Provider behavior change, evidence-based medicine, reminders, home health care, heart failure management

The difficulty of translating research findings into sustainable improvements in care practices and clinical outcomes is well documented (Grimshaw and Russell 1993; Woolf et al. 1999; AHRQ 2001; Grimshaw et al. 2001; Grol 2001; Gross et al. 2001). A growing number of studies show that passive

approaches, such as unsolicited distribution of consensus recommendations or guidelines, and traditional didactic lectures and seminars, generally are ineffective in changing clinical practice (Davis et al. 1995; Oxman et al. 1995; Bero et al. 1998). Strategies having more influence on provider behavior are audit and feedback by peers or opinion leaders, reminder systems, and multi-faceted interventions (Davis and Taylor-Vaisey 1997; Grimshaw et al. 2001; Wagner et al. 2001). Physicians generally have been the focus of studies examining practice change strategies, with the interventions targeting specific behaviors such as preventive care, prescribing practices, and test ordering. The study reported here expands the literature on translating research into practice by testing the effectiveness of two computer-based interventions designed to promote evidence-based practice among home care nurses. We describe the effect of these interventions on the adoption of evidence-based care practices for the treatment of heart failure (HF) patients.

Three relatively recent phenomena fuel interest in evidence-based practice among home care agencies. On the market front, rapid enrollment of Medicare beneficiaries in managed care organizations during the mid-to-late 1990s led to agency competition for managed care contracts and to the adoption of various disease management programs thought to be attractive to, and sometimes required by, managed care customers. On the regulatory front, the development and dissemination of the uniform home health assessment (i.e., the Outcome and Assessment Information Set, or OASIS) now mandated by the Centers for Medicare and Medicaid Services, has made outcomes-based reporting and regulation a reality for most home health agencies. Finally, on the payment front, the Balanced Budget Act of 1997 replaced cost-based reimbursement with a prospective payment system for Medicare home health that pays agencies a fixed dollar amount per episode of care and puts a premium on more efficient and effective use of clinical resources.

HF patients frequently are admitted to home care following a hospital stay with the objective of improving patient and family management of the disease. Referrals to home care, whether from a hospital or community-based physician, will include a preliminary set of medical orders that form the basis of the plan of care to be implemented by the home care nurse. At the first visit

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the nurse will perform an initial assessment of the patient and the home environment, seek verbal orders for necessary changes in the plan of care (e.g., updating an incomplete list of medications) and send the revised plan of care to the physician for signature. During subsequent visits nurses are responsible for ongoing assessment of the patient's condition, monitoring medications (and infrequently for HF patients, medication administration), instructing the patient about HF management, and implementing all medical orders. Home care nurses usually are generalists who vary in educational background and experience. All nurses, however, receive HF management training at the agency orientation.

The interventions tested were a *basic* intervention consisting of a single just-in-time e-mail reminder to nurses, and an *augmented* intervention in which the e-mail reminder was supplemented by additional provider prompts and patient education materials. Reminders trigger the action of the informed person without a preceding specific request, as compared with passive systems that require an individual to recognize when advice would be helpful and make an active effort to retrieve information. Litzelman and colleagues (1993) postulate that reminders work in the realm of prevention because they are consistent with the dual task theory of human performance. This theory suggests that performance of "secondary" preventive tasks in conjunction with hands-on medical care can be improved by organizing and presenting cogent information at critical times to reduce clinician overload and direct clinicians to tasks needing their attention. Chueh and Barnett (1997) describe the use of "just-in-time" reminders to identify patients who are candidates for a particular guideline and to send that guideline to the clinician at the right time and place. Employing a "system driven, 'push' approach," software programs can be used to trigger just-in-time e-mails to push out information to the clinician.

Electronic patient-specific clinical reminders were selected for study because of their efficacy in other settings and because they enabled us to address some of the unique challenges that the home care environment poses for quality improvement initiatives. Nurses in this setting usually care for a very diverse group of patients; the nurse workforce is largely decentralized; communication is impeded by the dispersion of patients and referring physicians; and few evidence-based practice recommendations have been adapted or developed for home health care (Brannon and Dansky 2001; Peterson 2004). We hypothesized that nurses receiving care recommendations at the time they are assigned a HF patient would be more likely than others to provide evidence-based care.

DATA AND METHODS

Conceptual Framework

Behavioral approaches to changing provider practices generally rely on a three-part conceptual model that emphasizes the importance of understanding: (1) the antecedents of a given behavior or practice, (2) the context in which the behavior occurs, and (3) its consequences (Marteau et al. 1998). Green and Kreuter (1999) have formulated a variant of this model, the "Precede/Proceed" model, which emphasizes diagnosis and evaluation of "predisposing," "enabling," and "reinforcing" factors that affect behavior change. Predisposing factors include a variety of individual practitioner characteristics (such as training, knowledge and beliefs) that affect motivation to change. Enabling factors include organizational and structural factors (such as reminders, checklists or information systems) that facilitate behavior change. Reinforcing factors include positive consequences, both tangible and intangible, that reward selected behaviors.

The interventions tested in this project primarily address enabling and reinforcing factors. As described below, the *basic* intervention is a straightforward and relatively simple strategy for targeting evidence-based practice information to an individual nurse at precisely the time and for precisely the patient for whom the information is appropriate. It assumes that knowledge and recall are the principal problems and that these factors can be effectively addressed through a single just-in-time e-mail reminder. The *augmented* intervention expands the information provided to the nurse to address enabling barriers and includes outreach from a clinical nurse specialist (CNS) who served as an "expert peer."

We hypothesized that, relative to usual care, the basic and augmented interventions will differentially and hierarchically affect nurse processes of care. Specifically, we hypothesized that the interventions would increase the adoption of evidence-based practices in the following areas highlighted in the e-mail message: (1) *assessment* of the patient's HF status, diet, and medication knowledge, adherence and side effects, and (2) *instructions* to the patient concerning HF and its management.

Study Design

The study employed a randomized design. Every nurse serving the targeted patient population at a large, urban, nonprofit home health agency was eligible for randomization. A computerized algorithm developed by project staff used baseline data from the initial assessment to identify patients meeting the

study criteria and the patient's "coordinator of care" (i.e., lead nurse). Random assignment to either the control group or one of two treatment groups (basic intervention or augmented intervention) occurred the first time a nurse began caring for an eligible patient. A nurse's initial random assignment to a group (usual care, basic intervention or augmented intervention) determined the status of all of the HF patients admitted to her care during the roughly one-and-a-half year enrollment period (June 2000–November 2001).

Interventions

The same "basic" e-mail reminder was sent to nurses in both intervention groups. The coordinator of care received the e-mail reminder *every time* an eligible patient was admitted to her care. It identified the eligible patient by name and HF as the primary diagnosis, and highlighted six HF-specific clinical practices for improving patient outcomes. A modified Delphi technique was used to determine the choice of practices to highlight in the e-mail (Fink et al. 1984). An expert panel was convened and given a side-by-side comparison of HF clinical practice guidelines, and asked to identify the most important practices in the home health setting. In addition to the study investigators, the expert panel included home care nurse specialists and area physicians specializing in cardiac conditions. The e-mail reminder consisted of an initial screen listing the six key practices in very abbreviated form (with the first letter of each practice spelling out the acronym "ADHERE") as well as subsequent screens that the nurse could consult for more detailed information (see Appendix 1 at http://www.blackwellpublishing.com/products/journals/suppmat/HESR/HESR00388/HESR00388sm.htm).

The augmented intervention substantially expanded the information and resources available to the nurse. For each eligible patient, a nurse in the augmented group was sent the basic e-mail reminder as well as a package of material with a cover letter stating that it was for the care of her patient with HF. The package included a laminated pocket card containing more detailed medication management information, a prompter card to help nurses improve communication with physicians, and a self-care guide for patients. The augmented group nurses also received follow-up outreach by a CNS who served as an "expert peer." The CNS was employed by the agency and available to all staff requesting assistance. The intervention outreach consisted of a standard e-mail message from the CNS, sent 1 week after the basic e-mail reminder, inquiring about the status of the eligible patient, whether the HF self-care guide was useful, and whether there was a patient issue the nurse would like to

discuss with the CNS. All e-mail reminders and information packets were distributed within 10 days of patients' admission to home care.

Study Population

The initial study population consisted of 388 nurses. Each nurse provided care to at least one patient meeting the criteria for inclusion in the study (i.e., a primary diagnosis of HF [ICD9-CM 428], age 18 or older, English or Spanish speaking, and able to give informed consent) who completed an in-person interview approximately 45 days after the home health admission. We eliminated control and intervention group nurses providing no more than an initial visit to their patients since there was no opportunity for the intervention to have an effect. We also excluded a small number of nurses missing the practice measures since the records for their patients were not available at the time of chart review. The final sample size is 354 nurses.

Nurse Practice Measures

Nurse practice measures were obtained from patient clinical records. A structured chart abstraction instrument was developed and pilot tested by the project team. It was designed to capture process of care information during a fixed period of time (i.e., from shortly after a patient's index home health admission through the last visit provided within 45 days of the index admission) regardless of whether this represented one or multiple episodes of home health care. All clinical record abstraction was completed by trained nurse reviewers who were blinded to the intervention group assignment of study nurses and their patients.

The chart abstraction tool collected information on the nurse's assessment of the patient and her instructions to the patient concerning HF and its management. The specific assessment and instruction items studied were those identified in the e-mail reminder sent to nurses in the intervention groups. At each home health visit provided by a study nurse to an eligible HF patient during the follow-up period, data were collected on whether the nurse recorded the assessment practices and instructions detailed below.

Assessment Practices. For each eligible HF patient, we determined whether the nurse recorded in the chart that she assessed: (1) the patient's weight, (2) whether the patient was short of breath, (3) whether the patient was edematous, (4) the patient's current diet, (5) the patient's medication knowledge, (6) the patient's adherence to medications, and (7) whether the patient was experiencing any medication side effects. The first three

assessment items were combined into a single binary measure referred to as the comprehensive HF assessment. If the nurse assessed each of these items at *all* visits provided to *all* of her HF patients in the study, the indicator has a positive value. The rationale for creating this measure was that nurses providing optimal care should be assessing these items at all visits. The remaining assessment items, which may only need to be assessed once, are binary measures with a positive value if the nurse assessed the item at least once for each of her HF patients in the study.

Nurse Instructions. Similarly, for each eligible HF patient, we determined whether the nurse recorded in the chart that she instructed the patient (or an informal caregiver) about the following HF signs and symptoms: (1) shortness of breath, (2) fluid weight gain, and (3) fatigue. We also determined whether the nurse recorded in the chart that she instructed the patient (or an informal caregiver) about (4) weighing herself, (5) how to manage fluid weight gain, (6) a low salt diet, (7) medication management, (8) methods to improve adherence to medications, and (9) when to contact a physician. Lastly, we determined whether the nurse documented that, (10) she gave the patient a HF self-care guide. All 10 instruction items are binary measures. An item has a positive value when the nurse recorded that she gave the instruction at least once to each of her HF patients in the study. The first three items, in addition, were combined into a single measure indicating that the nurse instructed each of her patients at least once about one or more of the three signs and symptoms of HF, or she recorded that the patient was instructed about "signs and symptoms" without naming them. We refer to this final measure as "global" instructions about the signs and symptoms of HF.

Estimation Procedure

In estimating the effects of the interventions on nurse practice, we capitalize on the study's randomized design and estimate impact models that exploit the orthogonality of the treatments to baseline variables to obtain unbiased estimates of intervention effects. To the extent possible, preintervention measures of the health and functional status of a nurse's patients, as well as nurse-specific and environmental characteristics that might confound the relationship between interventions and nurse practice, were included in multivariate models to control for chance differences across nurses and to improve the precision of estimates of intervention effects. These variables included preintervention measures of the average age, level of disability, and number of comorbid chronic conditions of each nurse's patients; the nurse's age, gender,

race/ethnicity, education level, employment status (i.e., staff versus per diem), years of employment, and overall caseload; and borough of practice.

A probit specification was used to model treatment effects on nurse assessment and instruction indicators. The magnitude of the intervention effects was estimated by comparing regression-adjusted probabilities for the three intervention groups. Specifically, the regression equation for each outcome (e.g., probability of comprehensive cardiovascular assessment) was used to calculate adjusted probabilities for each nurse in the sample assuming first treatment (e.g., augmented intervention) and then control status, holding the other variables constant. The average of the nurse-level adjusted values for each outcome represents the regression-adjusted probability in the presence and absence of each intervention.

For all process indicators, positive differences indicate better outcomes (i.e., evidence that the intervention contributed to improved care practice) holding other variables constant. A p-value of less than .05 was considered the critical level to determine statistical significance. However, estimates with p-values between .05 and .10 are discussed in the text as well. All data analyses were conducted using *SAS* 8.2 and *Stata* 7.0 statistical software.

Empirical Results

The characteristics of the nurses assigned to the control and the two intervention groups (i.e., basic and augmented) are reported in Table 1. Overall, the nurses in the study were female (92.7 percent) with an average age of 43.6 years. A little more than 60 percent of the nurses were black, non-Hispanic, while 23.2 percent were white, non-Hispanic, and 7.1 percent were Hispanic. Most nurses were "per diem" employees (i.e., 58.2 percent were paid on a per visit basis) and had been employed by the home care agency for an average of 7.4 years. Slightly more than half of the nurses had a bachelor's degree (52 percent) and an additional 4.2 percent had an advanced degree (master's or higher).

There were no statistically significant differences between control and basic intervention group nurses with one exception. A lower proportion of nurses in the basic group were per diem employees relative to nurses in the control group (53.5 versus 65.6 percent, respectively; $p = .059$). Nurses in the augmented intervention group, relative to control group nurses, were more likely to be female (95.8 versus 89.3 percent, respectively, $p = .059$), less likely to be per diem employees (55.1 versus 65.6 percent, respectively, $p = .097$),

Table 1: Basic Characteristics of the Nurse Population ($n = 354$)

	Usual Care (n = 122)	*Basic Intervention (n = 114)*	*p-Value Usual versus Basic*	*Augmented Intervention (n = 118)*	*p-Value Usual versus Augmented*
Percent female	89.3	93.0	.327	95.8	.059
Age					
Mean age in years (SD)	42.6 (9.2)	42.7 (9.6)	.660	45.5 (9.5)	.740
Age in categories (%)					
<36	27.1	25.4	.334	17.8	.146
36–45	32.8	41.2		29.7	
46–55	31.2	21.9		36.4	
>55	9.0	11.4		16.1	
Race/ethnicity (%)					
Black, non-Hispanic	63.1	62.3	.861	55.9	.330
White, non-Hispanic	21.3	18.4		29.7	
Hispanic	7.4	9.7		4.2	
Other or unknown	8.2	9.7		10.2	
Percent per diem	65.6	53.5	.059	55.1	.097
Mean years of employment (SD)	6.8 (6.1)	7.1 (6.3)	.671	8.3 (6.6)	.354
Educational level (%)					
Diploma	10.7	12.3	.423	17.0	.008
Associate	32.0	22.8		18.6	
Bachelor	52.5	55.3		48.3	
Advanced degree	2.5	5.3		5.1	
Missing	2.5	4.4		11.0	
Number of eligible patients (%)					
Only one	27.1	29.0	.669	26.3	.034
Only two	26.2	27.2		31.4	
Only three	17.2	21.1		27.1	
Four or more	29.5	22.8		15.3	

and differed in educational level ($p = .008$). A relatively small number of nurses were missing education data with the difference in distribution of missing values between the augmented and control groups contributing to the statistically significant difference in education level. As noted previously, the treatment effects reported below are adjusted for chance differences among the intervention and control groups in a range of factors including all of the baseline nurse characteristics reported in Table 1.

The majority of study nurses cared for only one (27.4 percent) or two (28.3 percent) eligible HF patients. The distribution is skewed to the right, however, with 22.6 percent of nurses caring for four or more eligible patients. There is a statistically significant difference between the control and augmented group nurses in the number of eligible patients admitted to their care

during the enrollment period ($p = .034$). A greater proportion of control group nurses cared for a relatively large number of eligible HF patients (i.e., four or more). To the extent that more frequent care of HF patients improves performance even in the absence of the intervention, this difference would tend to reduce augmented and control group nurse practice differences.

Impact of the Interventions on Assessment Practices

The interventions had a large and positive impact on whether the nurse recorded at each visit that she assessed the patient's weight, whether the patient was short of breath, and whether the patient was edematous (our "comprehensive" HF assessment measure). While only 3.7 percent of the nurses in the control group had a positive value for the comprehensive assessment measure, the figures are 13.3 percent ($p = .006$) and 23.9 percent ($p < .001$) for nurses in the basic and augmented intervention groups, respectively (top panel of Table 2).

The interventions also had a relatively large impact on whether the nurse assessed each of her HF patients at least once in several other areas that were the focus of the e-mail reminders. Specifically, only 27.6 percent of control group nurses assessed diet at least once for each of her HF patients compared with 38.2 percent of basic group nurses ($p = .076$) and 48.7 percent of the augmented group nurses ($p = .001$). Nurses in both intervention groups also were more likely than control group nurses to record that they assessed medication adherence (the differences between the control and basic group nurses and the control and augmented group nurses were significant at the $p = .024$ and $p = .077$ levels, respectively). Augmented group nurses, in addition, were more likely than control group nurses to record that they assessed medication side effects ($p = .030$).

Impact of Interventions on Instruction Practices

The interventions also had a positive impact on whether nurses instructed patients about the signs and symptoms of worsening HF (middle panel of Table 2). The proportion of nurses documenting that they instructed all of their HF patients at least once about shortness of breath was over 10 percentage points (or 55 percent) higher for nurses in the two intervention groups relative to nurses in the control group (the difference between basic versus control and augmented versus control group nurses were significant at $p = .021$ and $p = .053$, respectively). There also was a positive impact on instructions about fluid weight gain with a 9.3 percentage point difference between basic and control group nurses ($p = .097$) and a 19.1 percentage point

Table 2: Estimate of Treatment Effects on Percent of Nurses Completing Assessments and Providing Instruction

	Usual Care	*Basic Intervention*		*Augmented Intervention*	
	Adjusted Probability	*Adjusted Probability*	*Difference*	*Adjusted Probability*	*Difference*
Estimates of treatment effects on percent of nurses recording assessment items					
Comprehensive HF assessment	3.7	13.8	10.1 [.006]	23.9	20.2 [<.001]
Diet assessment	27.6	38.2	10.6 [.076]	48.7	21.1 [.001]
Medication knowledge	24.8	31.1	6.3 [.285]	34.4	9.6 [.109]
Medication adherence	48.2	62.7	14.5 [.024]	59.6	11.4 [.077]
Medication side-effects	12.7	15.3	2.6 [.558]	23.6	10.9 [.030]
Estimate of treatment effects on percent of nurses instructing patients about signs and symptoms of HF					
Shortness of breath	18.1	31.1	13.0 [.021]	28.9	10.8 [.053]
Fluid weight gain	20.6	29.9	9.3 [.097]	39.7	19.1 [.001]
Fatigue	11.8	10.5	− 1.3 [.752]	15.9	4.1 [.353]
Global instructions about signs and symptoms	42.1	53.9	11.8 [.070]	59.5	17.4 [.007]
Estimates of treatment effects on percent of nurses recording other HF management instructions					
Weighing self	16.0	37.2	21.2 [<.001]	48.7	32.7 [<.001]
Managing fluid weight gain	5.7	8.0	2.3 [.505]	11.9	6.2 [.116]
Low salt diet	22.7	40.4	17.7 [.003]	49.6	26.9 [<.001]
Medication management	51.2	57.0	5.8 [.385]	59.7	8.5 [.195]
Methods to improve adherence	15.0	26.5	11.5 [.030]	18.0	3.0 [.532]
Contacting MD	27.3	36.2	8.9 [.147]	42.8	15.5 [.014]
Education material	10.5	17.6	7.1 [.113]	46.2	35.7 [<.001]

Notes: *p*-values are in brackets. Adjusted probabilities are calculated based on underlying coefficients from multivariate models that control for the same set of nurse, patient, and location characteristics. These control variables include sociodemographic characteristics of the nurse (age, gender, race/ethnicity) as well as the nurse's home care employment status and experience, educational level, and caseload; the average baseline characteristics of the patients cared for by each nurse including the health and functional status of patients; and the geographic area where the nurse provided care. See Methods section for details on the assessment and instruction items.

HF, heart failure.

difference between augmented and control group nurses ($p = .001$). The findings were similar for the "global" indicator (i.e., the nurse instructed her patients at least once about one or more of the three signs and symptoms of HF, or she recorded that the patient was instructed about "signs and symptoms" without naming them).

The results for the remaining instructions that were the focus of the e-mail reminder are presented in the bottom panel Table 2. The intervention group nurses were more likely than control group nurses to instruct patients about weighing themselves ($p < .001$ in each case) and about a low-salt diet ($p = .003$ for the basic versus control group difference and $p < .001$ for the augmented versus control group difference). The impact of the interventions on the remaining areas of instruction was positive but not always statistically significant. For example, basic group nurses were more likely than control group nurses to instruct patients about methods to improve medication adherence ($p = .030$) but there was no statistically significant difference between augmented and control group nurses on this item. On the other hand, augmented group nurses were more likely than control group nurses to instruct patients about when to contact a physician ($p = .014$) and to give patients a HF self-care guide ($p < .001$), but there was no statistically significant difference between basic and control group nurses on these items.

Overall, there were a greater number of statistically significant effects for the augmented as opposed to the basic intervention. Nine out of the 16 tests of differences between the augmented and control group nurses were statistically significant at $p < .05$, and two more were significant at a level between $p = .05$ and $p = .10$. The comparable figures for the basic intervention are six and three, respectively. In addition, the impact of the augmented intervention tended to be larger in magnitude than that of the basic intervention, although differences in the parameter estimates for the two treatment group variables were statistically significant in only four cases (the comprehensive HF assessment [$p = .05$], diet assessment [$p = .10$], weighing self [$p = .08$], and giving educational material to the patient [$p < .01$]). In no case was a parameter estimate for the basic group significantly greater than that for the augmented group.

DISCUSSION

The purpose of this study was to examine the effectiveness of two relatively simple approaches to incorporate evidence-based strategies into day-to-day practice in a home health setting. Communicating inexpensively and

effectively with providers is one of the most difficult challenges involved in influencing practices and processes of care in home health where providers are geographically dispersed and spend a great deal of time in the field. The results of this randomized trial strongly support the efficacy of just-in-time reminders of evidence-based guidelines as a means of changing clinical practice among home health nurses. Both interventions tested in this study greatly improved use of evidence-based care in the areas of patient assessment and instruction about HF disease management. While not all results were statistically significant at the conventional level of $p < .05$, intervention effects were positive in virtually all cases and effect magnitudes frequently were large.

An e-mail reminder of the evidence-based practices for improving patient outcomes was sent to nurses in both intervention groups every time they began caring for an eligible HF patient. E-mail, a common form of electronic communication that permits the routine sending and receiving of messages, has received scant attention in the literature of telemedicine, even though it has the potential to reach vast numbers of clinicians (Spielberg 1998). The benefit of this mode of communication for educators and learners is that instruction can proceed regardless of geographic proximity and time scheduling barriers (Lyness and Raimond 1997). The results for the basic intervention group demonstrate that e-mail is a simple and effective means of "pushing" evidence-based reminders out at the right time and to the right place for geographically dispersed providers.

Nurses in the augmented group received a multifaceted intervention. At the same time they received the basic e-mail reminder, that is, every time new patients were assigned to their care, augmented group nurses received a package of material designed to improve their ability to provide evidence-based care to HF patients. Augmented group nurses also received a follow-up e-mail message from a CNS inquiring about the status of the eligible HF patient and offering to discuss any patient issues with the nurse. Multifaceted interventions have been found to be consistently effective in other settings (Bero et al. 1998) and our results indicate that in some cases the augmented intervention did have a greater impact on nurse practices as documented in patient records. While evidence of appropriate care practices has value in and of itself for regulatory purposes and continuity of patient care (Marrelli and Hilliard 1996), of particular interest is whether better practices do indeed translate into better *patient* outcomes. This issue is addressed in a companion paper (Feldman et al. 2005).

The low frequency with which many of the care practices were documented does raise questions about current practices in home health care. One

possibility is that the nurse is focusing her charting on the items in the federally mandated data collection system for home health care (i.e., OASIS) rather than HF-specific care. OASIS includes measures of the patient's general health and mental status as well as his or her ability to perform activities of daily living (e.g., bathing, dressing, transferring from bed to chair) but does not include any information on care processes. HF patients, in addition, often have one or more comorbidities (e.g., diabetes). Nurses may place more emphasis on other conditions if patients tell them that they have had HF for years and know all about self-management of the disease. The interventions, in any event, clearly did increase key HF care practices.

This study also demonstrates how evidence-based guidelines can be adapted and implemented in the home health setting. Clinical practice protocols and critical paths have been developed with the aim of controlling costs through the coordination of services while maintaining the quality of care, and now are widely used in hospitals (Vantassel 1990; Grudich 1991; Strong 1991; Crummer and Carter 1993). Despite evidence of their benefits in the acute care setting, however, guidelines, protocols and critical pathways have received minimal attention in home care (Corbett and Androwich 1994). We were able, with the assistance of an expert panel, to identify the elements of existing HF guidelines that are important to practice in the home health setting. Our approach suggests that evidence-based guidelines developed for other conditions (e.g., diabetes, wound care) may also be successfully adapted to home health care. The importance of this effort cannot be underestimated in an environment where public and private funders increasingly are asking for evidence that home health, like other types of health care, achieves well-defined outcomes.

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